

To the commission, the commissioners' staff, and all that apply:

My name is Kyle Drake, and I am a radio research and electronic design engineer. I am a signatory to the October 24, 2002 Motion For Rehearing, in FCC Docket MM 99-325, that was filed by THE AMHERST ALLIANCE, VIRGINIA CENTER FOR THE PUBLIC PRESS (VCP), and dozens of other groups and individuals.

As a party to this Motion, I am filing my own statement, to supplement and fortify what I strongly believe to be the already compelling case that is made in the Motion.

I have been doing a lot of work lately relating to low power AM broadcast systems (hereby referred to as LPAM). The data that will come out of my research will help broadcasters reduce the cost of deploying these systems while improving quality, antenna efficiency, and reduction of interference. My work will also have use in commercial AM stations that are looking to reduce the profile of their broadcast antennas. It has been my hope that this research will help to spread LPAM, in the form of TIS, Campus radio stations, and any possibility of creating a more general public LPAM service in the future.

It is with this level of familiarity with broadcasting on the AM band that I see major problems with the IBOC, not only regarding technical issues, but regarding FCC policy issues as well. I will cover my concerns extensively in this writing.

The interference problems that the IBOC system will cause could have potentially catastrophic effects, and are the biggest focus of my concerns. Not only will this increased interference affect current and future LPAM stations, it will also effect the reception and range of commercial stations as well. I am amazed that many engineers at the FCC and myself see eye-to-eye on this one fundamental point, yet they have still promoted the adoption of the service without even basic testing for interference concerns. The IBOC system will be used by thousands of radio stations and millions of radio listeners across the country, and it is dangerous for the FCC to adopt such an important and long term service without first doing at least a public comments period, and *extensive* testing for interference (especially when large amounts of interference are *expected*).

The IBOC system has had approval from a few groups, mainly the NSCB, which handles receiver concerns, and the National Association of Broadcasters. The support of these groups, however, proves little about the effectiveness of IBOC. The NAB has been known in the past for making poor decisions that have no solid technical base. It verges on childishness that the NAB would be a strong opponent of LPFM, a service that would have created marginal interference, and would support a service like the IBOC, which *will* create *significant* amounts of interference.

Getting technical, it is important to note what kind of interference I am talking about, as there are many forms of interference in radio broadcast systems.

The first major form of interference is referred to as “Harmonics” interference. The hybrid IBOC system doesn’t create any significant harmonics interference, when compared to existing analog systems.

There is another serious form of interference, however, which still remains a very serious problem in current broadcast systems. It is essentially when the radio transmitter exceeds allocated bandwidth on the frequency it was assigned, thus taking up more bandwidth than it is allowed. This type of interference is typically referred to as **phase noise**. 50kW stations are notorious for such interference, which is unavoidable at high power levels. Both the AM and FM broadcast bands are affected by phase noise. Since there is no practical way to resolve this issue, the FCC has chosen to award radio stations “adjacency protection” which provides open frequencies adjacent to the main frequency that cannot be used by nearby radio stations.

Completely ignoring potential phase noise problems, the IBOC designers adopted a hybrid standard for the AM broadcast band that *extends beyond the existing bandwidth allocated to stations*, which will undoubtedly *increase the existing problems that are associated with phase noise*. This will be a serious hazard for commercial broadcasters and a deadly one for LPAM broadcasters, when the already crowded radio bands start receiving additional signal garbage due to the adoption of the hybrid IBOC system.

To attempt to explain this phenomenon, I have drawn up a few diagrams. Please keep in mind that my analysis of the IBOC system is now focused exclusively on the AM system,

which is quite different from the FM system. Many people have expressed their concerns with the FM version of the IBOC system, which I will leave to people with expertise in FM broadcasting.

Figure 1 shows the 20kHz bandwidth that is traditionally assigned to AM stations. Note that this does not show adjacency protection or phase noise extensions.

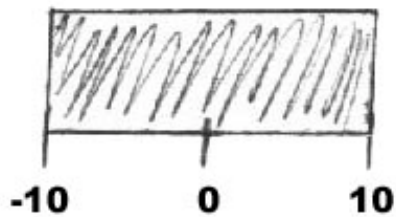


Figure 1: The traditional amount of bandwidth allocated to AM broadcasters, not including adjacency protection. Frequency is in kHz.

In Figure 2, I have sketched what the hybrid IBOC system calls for, in terms of signal bandwidth per radio broadcast. I retrieved this information from Ibiquity's white papers, which are freely available from their web site.

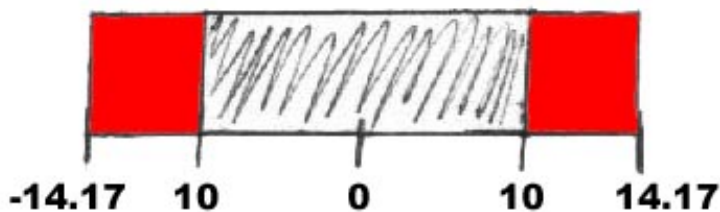


Figure 2: The amount of bandwidth required by the IBOC system, not including adjacency protection. The shaded portion represents the extension of the original bandwidth.

As you can see, the bandwidth is extended quite significantly. On paper, without any compensation for phase noise, the IBOC system calls for **9.43kHz, or 47.5% more spacing for each and every radio station!** This means that commercial broadcasters that were once able to broadcast within their assigned bandwidth without any troubles will now be pushing the amount of real estate they consume just to maintain the *desirable* signal, which will in turn increase phase noise. I find it quite disturbing that Ibiquity has failed to discuss or even mention this fact in their white paper.

The hybrid IBOC system, while being a very interesting idea, doesn't work. It still requires more signal bandwidth in order to accomplish its task, which destroys its original purpose. Not only will this be very harsh to LPAM services, it will be a nightmare to commercial broadcasters, who could lose millions of dollars from reduced signal range due to interference. Financially, this could be a serious burden to smaller broadcasters, who might not be able to come up with the funding to buy a new transmitter when the system goes all digital, that is, assuming their broadcast frequency hasn't fallen into the phase noise of an adjacent radio station, and is therefore completely unusable. And to top it all off, nobody is really sure how much phase noise there will be, because *there hasn't been any extensive interference testing!* I dare not bring up how this could affect nighttime broadcasters, when the ionospheric conditions allow high power AM signals to propagate at even farther distances.

With all the hassle of putting digital radio into use, I must ask the commission an important question: Why is the FCC switching to digital? I'm assuming the answer would

be to improve the fidelity of the current system. It is my belief that, while this is not necessarily a bad thing, it is the wrong focus that the commission should take when viewing the current broadcast system. First of all, I don't think fidelity is a very urgent problem for radio. There are many highly popular radio stations on the AM broadcast band, regardless of the reduced fidelity. Phrases like "Lack of fidelity is killing the AM broadcast band" are easily rebuked; the FCC has not had a filing window for AM licenses since 1989, and the amount of licensed AM broadcasters is slowly trickling down as a result. When there are fewer radio stations, there are fewer listeners. The AM broadcast band would be significantly more popular if focus was put into creating additional licenses for the band; the listener would have more incentive to tune to the band if there were more than just a few syndicated talk stations occupying it. Following this, it seems obvious to me that *content is more important to listeners than quality*. When faced with a choice, the FCC should be working to improve content, instead of working to improve fidelity. Most radio listeners are more interested in what the station plays, and not how well it replicates their CD players.

The very simple way to improve content is to allow more radio stations to get on the air. The FCC receives thousands of requests from companies and non-profit groups to receive broadcasting licenses, but is constantly turning them down due to lack of available frequencies. I understand the FCC's position towards this perfectly, at least in regards to the FM band; the current radio bands are crowded with stations, and adding additional licenses would only serve to create problems.

It is because of this, and for reasons of phase noise interference, that I would like to propose a new idea to the commission for possible consideration, one which I believe would suit all parties equally: Extend digital radio into its own radio band. While I realize that allocating frequencies can be difficult, the massive demand for more radio licenses deems it necessary. Also, there are many prime spots which could be made available for a new radio band, including the relatively unused UHF television frequencies, and the communications band that the *military has agreed to give up for such radio broadcasting*. The IBOC system could be used in the new band, as the interference problems only arise when IBOC is in hybrid mode, which would be unnecessary in a new radio band. The commission could also look into other forms of digital broadcasting, such as the Eureka-147 system, which appears to be widely accepted amongst the international community.

I also think that the commission should consider reopening filing windows for the AM broadcast band, which would provide a place for additional broadcasters to receive licenses, thus helping to resolve the real estate problem. Perhaps a noncommercial educational license system based on LPFM could be done in the AM band, providing a home for the many hundreds of groups that wish to start a radio station.

With these proposals, I end my writing. It is my belief that with a clear focus and good solid public commentary, the FCC could make a successful digital service, while maintaining the existing analog systems *and* increasing the amount of real estate dedicated to radio broadcasting in the process. Surely, a compromise that benefits everyone.

Respectfully Submitted,

Kyle Drake

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